PV Inverter

SUNNY BOY 2500/3000

Installation Manual

SB25_30-IA-IEN115050 | IMEN-SB25_30 | Version 5.0

EN

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1 Information on this Manual

1.1 Validity

This manual describes the mounting, installation, commissioning, maintenance, and troubleshooting procedures for the following SMA inverters:

- Sunny Boy 2500 (SB 2500, SB 2500-IT)
- Sunny Boy 3000 (SB 3000, SB 3000-IT)

Keep this manual in a convenient place for future reference.

1.2 Target Group

This manual is for electrically qualified persons. The tasks described in this manual may be performed by electrically qualified persons only.

1.3 Additional Information

You will find further information on special topics such as designing a miniature circuit-breaker or the description of the operating parameters in the download area at www.SMA.de/en.

Refer to the user manual provided for detailed information on operating the inverter.

1.4 Symbols Used

The following types of safety precautions and general information are used in this manual:

DANGER!

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE!

NOTICE indicates a situation which, if not avoided, could result in property damage.

Information

Information provides tips that are valuable for the optimal installation and operation of your product.

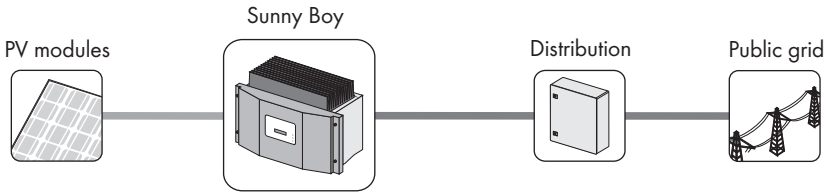
☑ This symbol indicates the result of an action.

2 Safety

2.1 Intended Use

The Sunny Boy is a PV inverter which converts the DC current of the PV array to AC current and feeds it into the power distribution mains.

Principle of a PV Plant with this Sunny Boy



The Sunny Boy may only be operated with PV arrays (modules and cabling) of protection class II. Do not connect any energy sources other than PV modules to the Sunny Boy.

When designing the PV plant, ensure that the values comply with the permitted operating range of all components at all times. The free design program "Sunny Design" (www.SMA.de/en/SunnyDesign) will assist you. The manufacturer of the PV modules must have approved the modules for use with this Sunny Boy device. You must also ensure that all measures recommended by the module manufacturer regarding long-term maintenance of the module properties are taken (see also Technical Information "Module Technology" in the download area of www.SMA.de/en).

Do not use the Sunny Boy for purposes other than those described here. Alternative uses, modifications to the Sunny Boy or the installation of component parts not expressly recommended or sold by SMA Solar Technology AG shall void any warranty claims and the operation permission.

2.2 Safety Precautions

DANGER!

Danger to life due to high voltages in the inverter

- All work on the inverter may only be carried out by an electrically qualified person.

CAUTION!

Risk of burns due to hot enclosure parts

- Do not touch the enclosure during operation.
- Only touch the lid during operation.

WARNING!

Risk of electric shock when pulling out the DC connectors under load

If you disconnect the DC connectors from the inverter under load, an electric arc may occur, leading to electric shock and burns.

- If the inverter is not equipped with an Electronic Solar Switch and the regulations valid at the installation site require an external DC switch-disconnector, install an external DC switch-disconnector.
- Switch off the AC miniature circuit-breaker and disconnect the inverter on the DC side before pulling out the DC connectors.

NOTICE!

Dust and water intrusion can damage the inverter.

If the inverter is equipped with an Electronic Solar Switch, it will only provide IP21 degree of protection once the Electronic Solar Switch has been pulled out. The inverter is therefore no longer protected against water and dust intrusion. In order to also maintain degree of protection IP65 during temporary decommissioning, proceed as follows:

- Unlock and disconnect all DC connectors.
- Open all DC connectors and remove the cables.
- Close all DC inputs with the corresponding DC connectors and the supplied sealing plugs.
- If an Electronic Solar Switch is installed, reattach the Electronic Solar Switch firmly.

PV array earthing

Comply with local regulations when earthing the modules and the PV array.
SMA Solar Technology AG recommends connecting the array frame and other electrically conductive surfaces so that there is continuous conduction and to earth them in order to ensure maximum protection for installations and persons.

2.3 Explanation of Symbols

This section gives an explanation of all the symbols found on the inverter and on the type label.

2.3.1 Symbols on the Inverter

Symbol	Explanation
	Operation display Indicates the operating state of the inverter.
	Ground fault or varistor defective Read Section 9.3 "Red LED is Permanently Lit" (page 56).
	Error or fault Read Section 9 "Troubleshooting" (page 52).
	You can operate the display by tapping on the enclosure lid: • Tapping once: the backlight switches on or the display scrolls to the next display message. • Tapping twice in quick succession*: the inverter shows the display messages from the startup phase again (see Section 6.2 "Display Messages during the Startup Phase" (page 39)).
	DC switch-disconnector Electronic Solar Switch (ESS)** • ❶ When the Electronic Solar Switch is plugged in, the electric DC circuit is closed. • ❶ To interrupt the electric DC circuit and disconnect the inverter securely under load, you have to first pull out the Electronic Solar Switch ❶ and then remove all DC connectors ❷ as described in Section 7.2 "Opening the Inverter" (page 45).
	QR-Code®*** for SMA bonus program You will find information on the SMA bonus programme at www.SMA-Bonus.com.

* This function is valid from firmware version 4.00, not for SB 2500-IT/3000-IT

** Optional

*** QR-Code is a registered trademark of DENSO WAVE INCORPORATED.

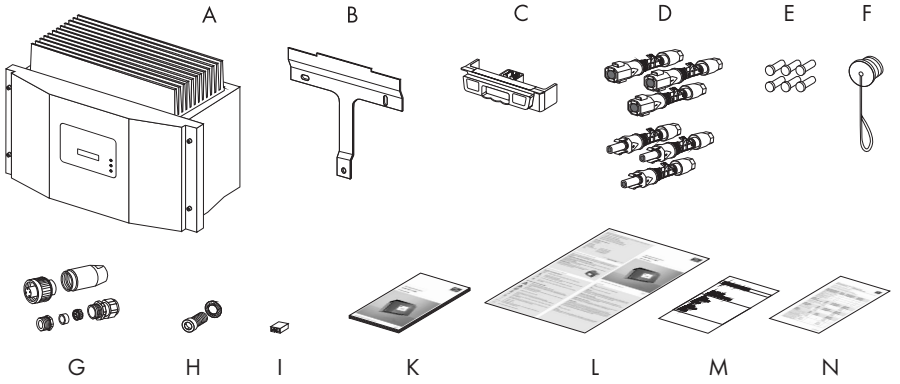
2.3.2 Symbols on the Type Label

Symbol	Explanation
	Beware of hazardous voltage. The inverter operates at high voltages. All work on the inverter may only be carried out by an electrically qualified person.
	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.
	Observe all documentation that accompanies the inverter.
	The inverter must not be disposed of together with the household waste. For more information on disposal, see Section 10.4 "Disposing of the Inverter" (page 62).
CE	CE marking The inverter complies with the requirements of the applicable EC guidelines.
	The inverter has a transformer
	Direct current (DC)
	Alternating current (AC)
	Degree of protection IP65 The inverter is protected against dust intrusion and water jets from any angle.
	RAL quality mark for solar products The inverter complies with the requirements of the German Institute for Quality Assurance and Labeling.
	Australian mark of conformity

3 Unpacking

3.1 Scope of Delivery

Check the delivery for completeness and for any visible external damage. Contact your specialty retailer if anything is damaged or missing.



Object	Quantity	Description
A	1	Sunny Boy
B	1	Wall mounting bracket
C	1	Electronic Solar Switch (ESS)*
D	6 (2)	DC connector (3 x positive, 3 x negative)**
E	6 (2)	Sealing plug for DC connectors***
F	1	Protective cap for AC jack on inverter
G	1	AC connection socket: jack element, threaded sleeve, PG13.5 pressure screw, PG13.5 sealing ring, PG13.5 fastening case, PG16 cable gland
H	1	M6x12 cheese-head screw and conical spring washer
I	1	Jumper
K	1	Installation manual
L	1	User manual
M	1	Document set with explanations and certificates
N	1	Supplementary sheet with inverter default settings

* Optional

** For inverters without ESS: 1 x positive, 1 x negative

*** For inverters without ESS: 2 sealing plugs

3.2 Identifying the Inverter

You can identify the inverter using the type label. The type label is on the right-hand side of the enclosure.

The serial number (Serial No.) and the type (Type/Model) of the inverter, as well as device-specific characteristics are specified on the type label.

4 Mounting

4.1 Safety

DANGER!
Danger to life due to fire or explosion

Despite careful construction, electrical devices can cause fires.

- Do not mount the inverter on flammable construction materials.
- Do not mount the inverter in areas where highly flammable materials are stored.
- Do not mount the inverter in a potentially explosive atmosphere.

CAUTION!
Risk of burns due to hot enclosure parts

- Mount the inverter in such a way that the enclosure cannot be touched inadvertently.

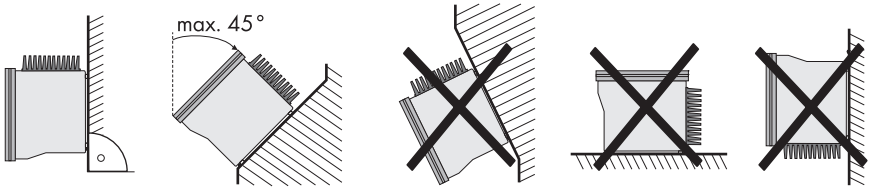
CAUTION!
Risk of injury due to the heavy weight of the inverter

- Take the inverter's weight of approx. 32 kg into account for mounting.

4.2 Selecting the Mounting Location

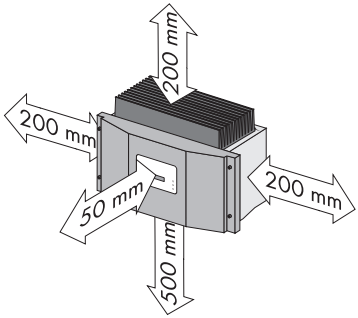
Consider the following requirements when selecting the mounting location:

- The mounting method and location must be suitable for the inverter's weight and dimensions (see Section 11 "Technical Data" (page 63)).
- Mount on a solid surface.
- The mounting location must at all times be clear and safely accessible without the use of additional aids such as scaffolding or lifting platforms. Non-fulfillment of these criteria may restrict servicing.



- Mount vertically or tilted backwards by max. 45°.

- The connection area must point downward.
- Never mount the device with a forward tilt.
- Never mount the device with a sideways tilt.
- Do not mount horizontally.
- Install at eye level in order to allow operating states to be read at all times.
- To ensure optimal operation, the ambient temperature should be below 40°C.
- Do not expose the inverter to direct solar irradiation as this can cause excessive heating and thus power reduction.
- In a living area, do not mount the unit on plasterboard walls (or similar) in order to avoid audible vibrations. When in use, the inverter emits noises which may be perceived as a nuisance in a living area.
- Observe the minimum clearances to walls, other inverters or objects as shown in the diagram in order to ensure sufficient heat dissipation and sufficient space for removing the Electronic Solar Switch.



Multiple inverters installed in areas with high ambient temperatures

If necessary, increase the clearance spaces and make sure there is enough fresh-air supply to ensure sufficient cooling of the inverters.

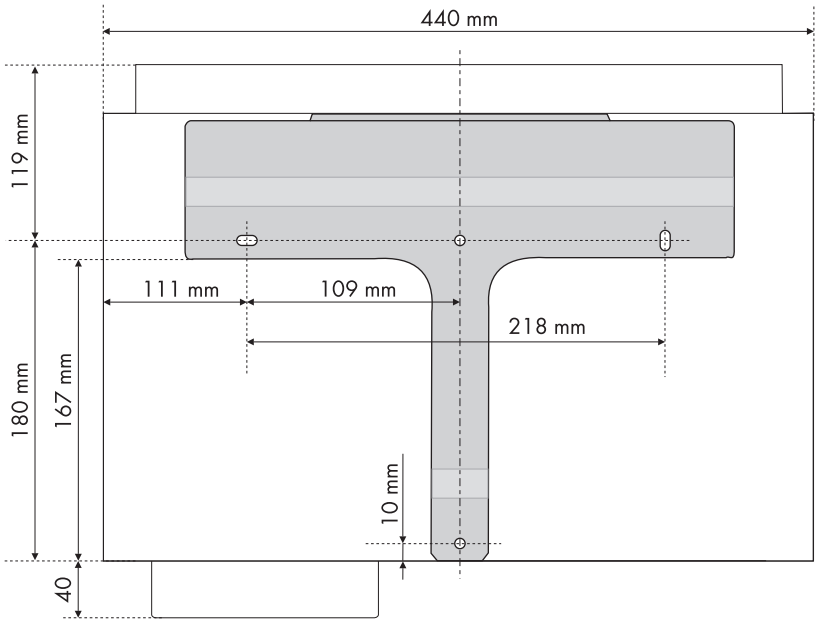
4.3 Mounting the Inverter with the Wall Mounting Bracket

CAUTION!

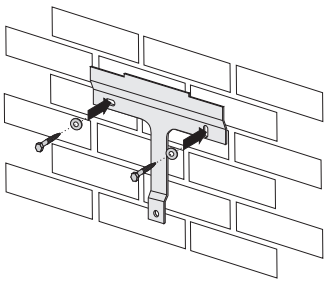
Risk of injury due to the heavy weight of the inverter

- Take the inverter's weight of approx. 32 kg into account for mounting.
- Use mounting material suitable for the surface when attaching the wall mounting bracket.

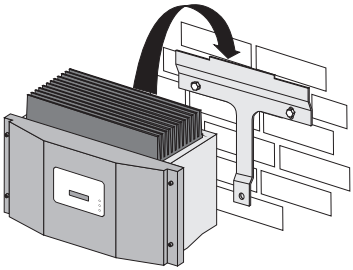
1. Use the wall mounting bracket as a drilling template and mark the positions of the drill holes.



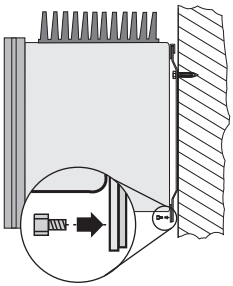
2. Attach the wall mounting bracket to the wall using appropriate screws and washers.



3. Mount the inverter with its upper anchorage bracket on the wall mounting bracket in such a way that it cannot slide out of the bracket sideways.



4. If a second protective conductor is required in the country of installation, earth the inverter and fix it securely as described in Section 5.2.3 "Connecting Additional Earthing" (page 27).
5. If a second protective conductor is not required, fix the inverter securely using the enclosed M6x12 screw.



6. Check to ensure that the inverter is securely in place.

☑ The inverter is mounted to the wall.

5 Electrical Connection

NOTICE!

Electrostatic discharges can damage the inverter.

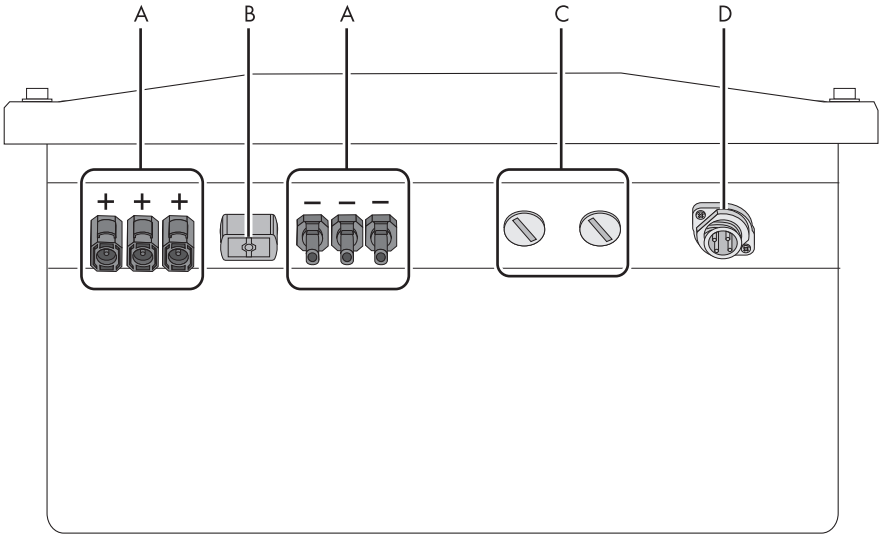
Internal component parts of the inverter can be irreparably damaged by static electric discharge.

- Earth yourself before touching a component part.

5.1 Overview of the Connection Area

5.1.1 Exterior View

The following figure shows the assignment of the individual connection areas on the bottom of the inverter.



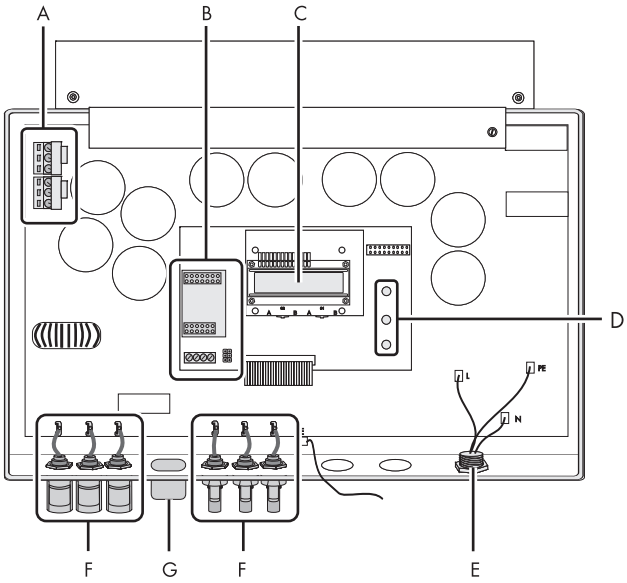
Object	Description
A	DC connectors for connecting the PV strings*
B	Jack for connecting the DC switch-disconnector Electronic Solar Switch (ESS)**
C	Enclosure opening with filler-plugs for communication
D	Jack for AC connection

* If you have ordered the inverter without ESS, the inverter is equipped with 1 negative and 1 positive DC connector.

** Optional

5.1.2 Interior View

The following figure shows the various components and connection areas of the open inverter.



Object	Description
A	Varistors
B	Connection area and slots for optional communication via RS485
C	Display
D	Operating status LEDs
E	Jack for AC connection
F	DC connector*
G	Jack for the Electronic Solar Switch (ESS)**

* If you have ordered the inverter without ESS, the inverter is equipped with 1 negative and 1 positive DC connector.

** Optional

5.2 Connection to the Power Distribution Mains (AC)

5.2.1 Conditions for the AC Connection

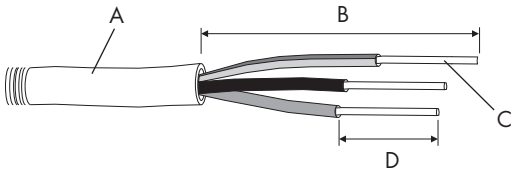
Connection requirements of the network operator

Comply with the connection requirements of your network operator.

Cable dimensioning

Use Sunny Design version 2.0 or higher for dimensioning the conductor cross-sectional areas (see Sunny Design programme at www.SMA.de/en).

Cable requirements



Position	Designation	Value
A	External diameter	9 mm ... 17 mm
B	Stripping length	30 mm
C	Conductor cross-section	Max. 2.5 mm²
D	Length of insulation to be stripped off	4 mm ... 5 mm

Load Disconnection Unit

You must install a **separate** miniature circuit-breaker for each inverter in order to ensure that the inverter can be securely disconnected under load. The maximum permissible fuse protection can be found in Section 11 "Technical Data" (page 63).

Detailed information and examples for the rating of a miniature circuit-breaker can be found in the Technical Information "Miniature Circuit-breaker" in the SMA Solar Technology AG download area at www.SMA.de/en.

DANGER!
Danger to life due to fire

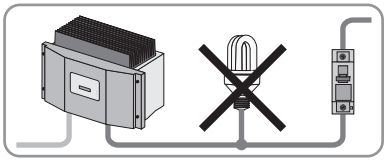
When more than 1 inverter is connected in parallel to the same miniature circuit-breaker, the protective function of the miniature circuit-breaker is no longer guaranteed. It can result in a cable fire or destruction of the inverter.

- Never connect several inverters to a single miniature circuit-breaker.
- Observe the maximum permissible fuse protection of the inverter when selecting the miniature circuit-breaker.

DANGER!
Danger to life due to fire

When a generator (inverter) and a load are connected to the same miniature circuit-breaker, the protective function of the miniature circuit-breaker is no longer guaranteed. The currents from the inverter and the mains can accumulate to overcurrents that are not detected by the miniature circuit-breaker.

- Never connect loads between the inverter and the miniature circuit-breaker without protection.
- Always protect loads separately.



NOTICE!

Damage to the inverter by using screw type fuse elements as a load disconnection unit

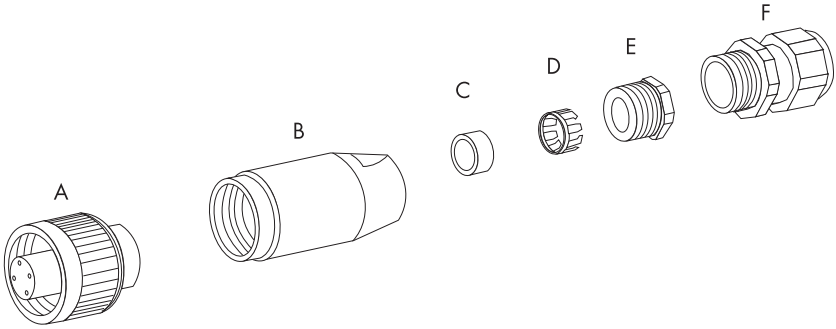
A screw type fuse element, e.g. DIAZED fuse or NEOZED fuse, is not a switch-disconnector, and thus may **not** be used as a load disconnection unit. A screw type fuse element serves as cable protection only.

When disconnecting under load using a screw type fuse element, the inverter can be damaged.

- Use only a switch-disconnector or a miniature circuit-breaker as a load disconnection unit.

5.2.2 Connecting the Inverter to the Power Distribution Mains (AC)

Overview of the AC connection socket

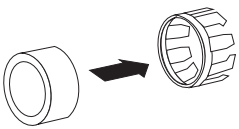
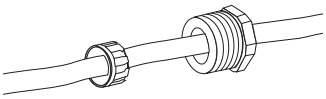
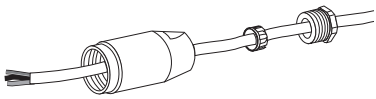
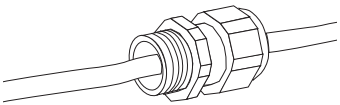
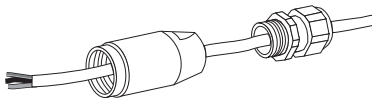


Object	Description
A	Jack element
B	Threaded sleeve
C	PG13.5 sealing ring
D	PG13.5 fastening case
E	PG13.5 pressure screw (for a cable diameter between 9 mm ... 13.5 mm)
F	PG16 cable gland (for a cable diameter between 13.5 mm ... 17 mm)

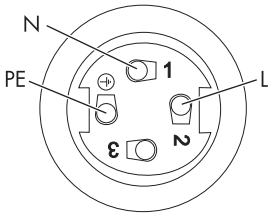
Procedure

1. Choose an appropriate gland for the AC cable.
2. Check the line voltage and compare with "$V_{AC\ nom}$" on the type label.

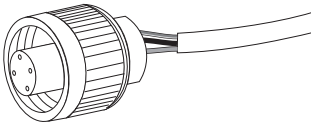
   The exact operating range of the inverter is specified in the operating parameters. The corresponding document can be found in the download area at www.SMA.de/en, in the "Technical Description" category of the respective inverter.
3. Switch off the miniature circuit-breaker, ensure that the device cannot be unintentionally or accidentally reconnected, and ensure that no voltage is present.
4. Strip approx. 30 mm from the AC cable.
5. Shorten L and N by 5 mm.
6. Strip 4 to 5 mm of insulation from the AC cable conductors.
7. Pass the pressure screw and/or cable gland and threaded sleeve over the AC cable.

Size used	Procedure
PG13.5	• Push the sealing ring into the fastening case.  • Slide the PG13.5 pressure screw and the fastening case including the sealing ring over the AC cable.  • Slide the threaded sleeve over the AC cable. 
PG16	• Slide the PG16 cable gland over the AC cable.  • Slide the threaded sleeve over the AC cable. 

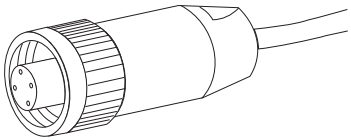
8. Insert the protective conductor PE (green-yellow) into the screw terminal with the earthing sign on the jack element and tighten the screw.
9. Insert the neutral conductor N (blue) into screw terminal 1 on the jack element and tighten the screw.
10. Insert phase L (brown or black) into screw terminal 2 on the jack element and tighten the screw.
11. Leave screw terminal 3 on the jack element free.



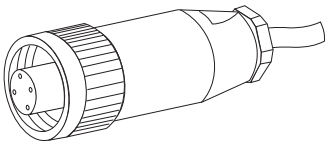
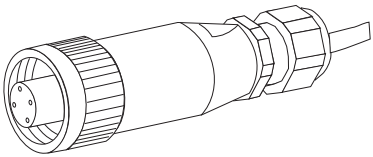
12. Make sure the insulated conductors are securely connected.



13. Screw the threaded sleeve onto the jack element.



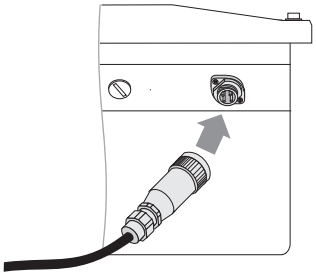
14. Tighten the pressure screw or cable gland onto the threaded sleeve.

Size used	Procedure
PG13.5	 The fastening case along with the sealing ring is pressed into the threaded sleeve and can no longer be seen.
PG16	• Tighten the swivel nut of the cable gland. 

☑ AC connection socket has been screwed together.

15. If the AC connection socket is not immediately connected to the inverter, close the AC plug on the inverter with the protective cap provided.

16. Insert the AC connection socket into the AC jack on the inverter. Remove the protective cap beforehand, if required.
17. Screw the threaded ring of the AC connection socket tightly onto the AC jack on the inverter. The threaded ring serves to seal and relieve strain on the AC connection socket.



☑ The AC cable is connected to the inverter.

DANGER!

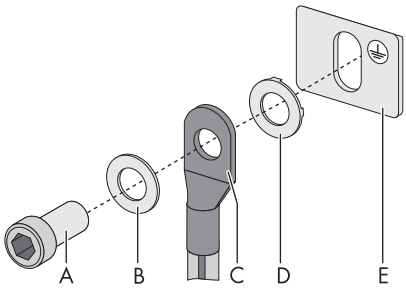
Danger to life due to high voltages in the inverter.

- Do not switch on the miniature circuit-breaker until the PV array has been connected and the inverter is securely closed.

5.2.3 Connecting Additional Earthing

If a second protective conductor, additional earthing or equipotential bonding is required, you can additionally earth the inverter on the enclosure.

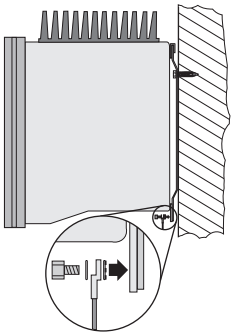
Overview of the additional earthing



Object	Description
A	M6x12 cheese-head screw (included in the scope of delivery)
B	Washer
C	Terminal lug (M6) with protective conductor
D	Conical spring washer (included in the scope of delivery)
E	Metal bracket on the underside of the enclosure
F	Wall mounting bracket of the inverter

Procedure

1. Align washer, terminal lug with protective conductor and conical spring washer on the cheese-head screw. The teeth of the conical spring washer must be facing the metal bracket.
2. Insert the cheese-head screw into the metal bracket on the underside of the enclosure and tighten it to the wall mounting bracket. Tighten the cheese-head screw to a torque of 6 Nm.
3. Make sure that the contact between the protective conductor and the enclosure is in accordance with the regulations valid for the country of installation.

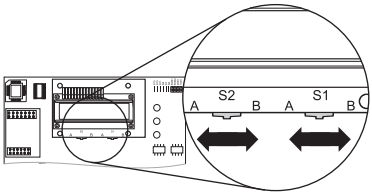


5.3 Setting the Display Language

You can set the language of the display using the switches at the bottom of the display assembly inside the inverter.

Procedure

1. Open the inverter as described in Section 7.2 "Opening the Inverter" (page 45).
2. Set the switches to the required language, as shown below.



Language	Switch S2	Switch S1
German	B	B
English	B	A
French	A	B
Spanish	A	A

The following switch settings apply for type SB 2500-IT/3000-IT inverters:

Language	Switch S2	Switch S1
Italian	B	A
English	A	A

3. Close the inverter as described in Section 7.3 "Closing the Inverter" (page 48).

☑ The display language is set.

5.4 PV Array Connection (DC)

5.4.1 Conditions for the DC Connection

Use of adaptors

Adaptors (Y plugs) must not be visible or freely accessible in the immediate surroundings of the inverter.

- The electric DC circuit must not be interrupted by adaptors.
- Observe the procedure for disconnecting the inverter as described in Section 7.2 "Opening the Inverter" (page 45).

- Requirements for the PV modules of the connected strings:
  - Same type
  - Same quantity
  - Identical alignment
  - Identical tilt
- The connecting cables of the PV modules must be equipped with connectors. The DC connectors for the DC connection are included in the delivery.
- The following limiting values at the DC input of the inverter must not be exceeded:

Inverter	Maximum input voltage	Maximum input current
SB 2500 **SB 2500-IT**	600 V (DC)	12.0 A (DC)
SB 3000 **SB 3000-IT**	600 V (DC)	12.0 A (DC)

DANGER!

Risk of lethal electric shock or fire

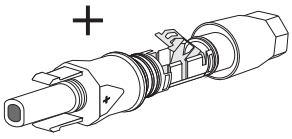
The maximum possible input current per string is limited by the connectors used. If the connectors are overloaded, an electric arc may occur and there is a risk of fire.

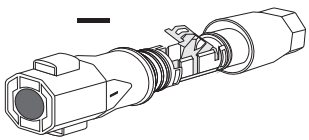
- Ensure that the input current for each string does not exceed the maximum through-fault current of the connectors used.

5.4.2 Assembling the DC Connectors

For connection to the inverter, all connection cables of the PV modules must be equipped with the DC connectors provided.

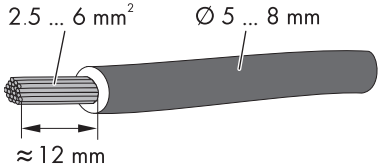
To assemble the DC connectors, proceed as follows. Ensure the connectors have the correct polarity. The DC connectors have the symbols "+" and "–".





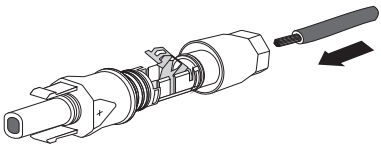
Cable requirements:

- Use a PV1-F cable.

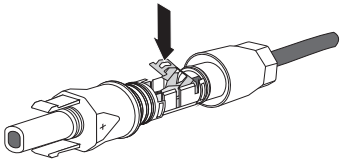


Procedure

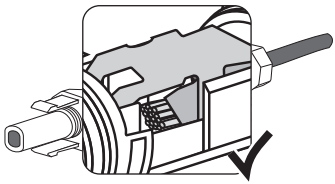
1. Insert the stripped cable into the plug as far as possible.

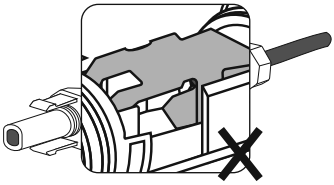
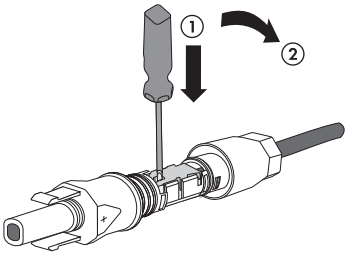


2. Press the clamping bracket down until it audibly snaps into place.

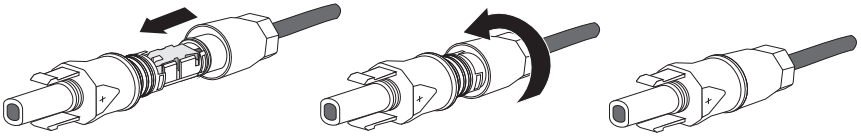


3. Ensure the cable is correctly in place.

Result	Measure
☑ If the conductors are visible in the hollow cavity of the clamping bracket, the cable is in the correct position. 	• Proceed to step 4.

Result	Measure
☑ If the conductors are **not** visible in the hollow cavity, the cable is not in the correct position. 	• Loosen the clamping bracket. For this purpose, use a screwdriver with a blade width of 3.5 mm.  • Remove the cable and start again from step 1.

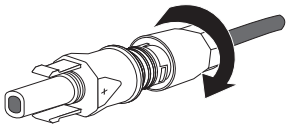
4. Push the cable gland toward the thread and fasten to a torque of 2 Nm.



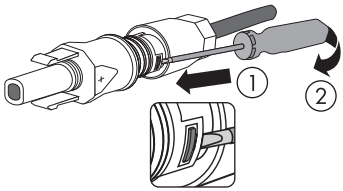
☑ The DC connectors are assembled and can now be connected to the inverter as described in Section 5.4.4 "Connecting the PV Array (DC)" (page 33).

5.4.3 Opening the DC Connector

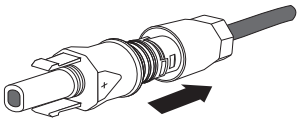
1. Unscrew the cable gland.



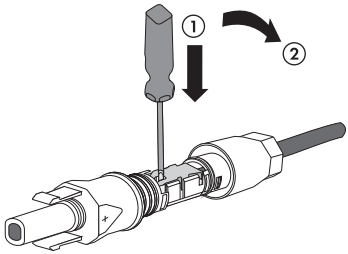
2. To release the plug, slot a screwdriver into the side catch mechanism and lever out. For this purpose, use a screwdriver with a blade width of 3.5 mm.



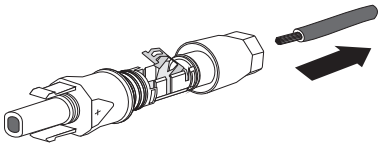
3. Carefully pull the DC connector apart.



4. Loosen the clamping bracket. For this purpose, use a screwdriver with a blade width of 3.5 mm.



5. Remove the cable.



☑ The cable is removed from the DC connector.

5.4.4 Connecting the PV Array (DC)

DANGER!

Danger to life due to high voltages in the inverter

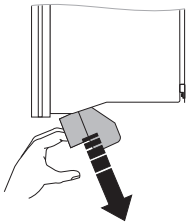
- Before connecting the PV array, ensure that the miniature circuit-breaker is switched off.

NOTICE!

Excessive voltages can destroy the measuring device.

- Only use measuring devices with a DC input voltage range up to at least 1 000 V.

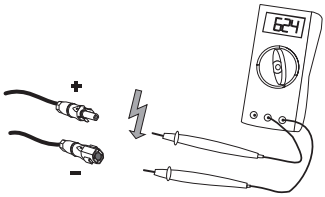
1. Disconnect the miniature circuit-breaker and secure against reconnection.
2. If an external DC switch-disconnector is present, disconnect the external DC switch-disconnector.
3. If an Electronic Solar Switch is installed, pull the Electronic Solar Switch downwards, slightly towards the wall.



4. Check the connection cables of the PV modules for correct polarity and make sure that the maximum input voltage of the inverter is not exceeded.

   At an ambient temperature above 10°C, the open-circuit voltage of the PV modules must not be more than 90% of the maximum inverter input voltage.

   Otherwise, check the plant design and the PV module circuitry. If this is not done, the maximum inverter input voltage can be exceeded at low ambient temperatures.



NOTICE!

Exceeding the maximum input voltage can destroy the inverter.

If the voltage of the PV modules exceeds the maximum input voltage of the inverter, it can be destroyed by the overvoltage.

This will void all warranty claims.

- Do not connect strings with an open-circuit voltage greater than the maximum input voltage of the inverter.
- Check the plant design.

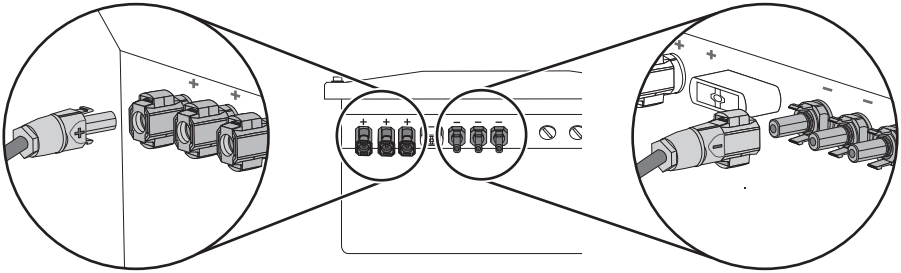
5. Check the strings for ground faults as described in Section 9.3.1 "Checking the PV Array for Earth Faults" (page 57).

DANGER!

Risk of lethal electric shock.

- Do not connect strings with ground faults.
- First, rectify the earth fault in the respective string.

6. Check the DC connectors for correct polarity and connect them.
   To unlock the DC connectors, see Section 7.2 "Opening the Inverter" (page 45).

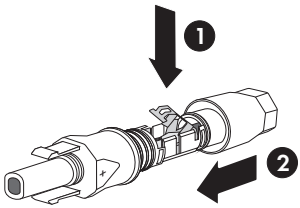


7. In order to seal the inverter, all the DC inputs that are not required have to be closed with DC connectors and sealing plugs:

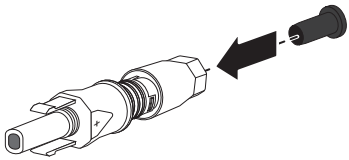
Sealing plugs

- Do **NOT** insert the sealing plugs **DIRECTLY** into the DC inputs on the inverter.

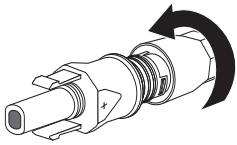
– For unused DC connectors, push down the clamping bracket and push the cable gland toward the thread.



– Insert the sealing plug into the DC connector.

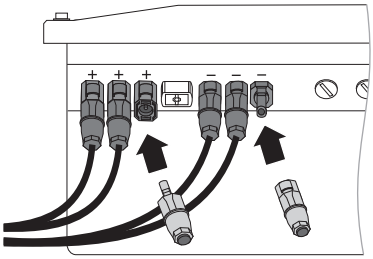


– Tighten the DC connector (torque: 2 Nm).



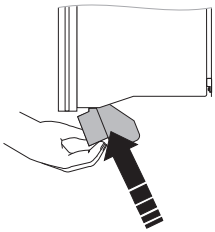
– Insert the DC connectors with sealing plugs into the corresponding DC inputs on the inverter.

☑ The DC connectors click audibly into position.



8. Ensure that all DC connectors are securely in place.

9. If an Electronic Solar Switch is installed, check the Electronic Solar Switch for wear, as described in Section 8.2 "Checking the Electronic Solar Switch for Wear" (page 50), and reattach it firmly.



NOTICE!

Manipulating the connector in the handle can damage the Electronic Solar Switch.

The connector within the handle must remain movable in order to ensure proper contact. Tightening the screw voids all warranty claims and creates a fire risk.

- Do **not** tighten the connector screw in the Electronic Solar Switch handle.

NOTICE!

The Electronic Solar Switch can be damaged if it is not plugged in correctly.

If it is not correctly connected, the Electronic Solar Switch can be damaged by high voltages.

- Plug the handle firmly onto the jack of the Electronic Solar Switch.
- Check that the handle is securely in place.

☑ The PV array is connected.

5.5 Communication

The inverter is equipped with a slot for communication interfaces in order to communicate with special data capture devices (e.g., Sunny WebBox) or a PC with corresponding software (e.g. Sunny Data Control or Sunny Explorer).

Refer to the communication interface manual for a detailed wiring diagram and a mounting description.

The inverter's active power can be limited externally using the Power Reducer Box from SMA Solar Technology AG. You will find detailed information on active power limitation in the Technical Description "Operating Parameters" at www.SMA.de/en.

5.6 Setting the Mains and Country Parameters

Changing mains-relevant and country parameters

To change mains-relevant parameters, you need a personal access code – the so-called SMA Grid Guard code. The application form for the personal access code is available in the download area at www.SMA.de/en, in the "Certificate" category of the respective inverter.

Ensure that you discuss the changes to these parameters with your network operator.

A detailed description of the operating parameters for the inverter is available in the download area at www.SMA.de/en in the category "Technical Description" of the respective inverter.

5.6.1 Setting the Installation Country

Using the "Default" parameter, you can set the installation country and/or the mains connection standard valid for the country via a communication device (e.g., Sunny WebBox) or a PC with corresponding software (e.g., Sunny Data Control or Sunny Explorer). This, however, is only required if the inverter was originally ordered for another country. You can see the standard to which the inverter was set upon delivery on the type label and on the included supplementary sheet with the default settings.

5.6.2 Setting Stand-alone Mains Operation

To operate the inverter in a stand-alone mains system with Sunny Island, you must set the "Default" parameter to stand-alone mains ("OFF-Grid") operation.

You have several possibilities to set the inverter to stand-alone mains operation:

- Setting via Sunny WebBox

  or

- Setting via Sunny Data Control or Sunny Explorer

DANGER!

Danger to life due to high voltages in the event of outage of the power distribution mains

If you set the inverter to stand-alone mains operation, it does not fulfill any country-specific standards and guidelines. Therefore, in the event of power distribution mains outage, there is a danger of backfeed.

- **Never** operate the inverter directly on the power distribution mains when set to stand-alone mains operation.

6 Commissioning

6.1 Commissioning the Inverter

1. Check the following requirements before commissioning:
   - The inverter is securely in place.
   - Correct connection of the AC cable (mains)
   - Complete connection of all DC cables (PV strings)
   - Unused DC inputs are closed using the corresponding DC connectors and sealing plugs
   - The enclosure lid is securely screwed in place.
   - External DC switch-disconnector additionally connected if Electronic Solar Switch available, the Electronic Solar Switch (ESS) is firmly in place
   - The miniature circuit-breaker is correctly laid out
2. Switch on the miniature circuit-breaker.
   ☑ All three LEDs are lit or flashing: the startup phase is starting.
   ☑ Green LED is lit: commissioning was successful.

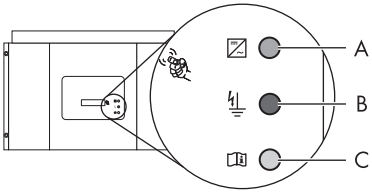
   or

   ☑ Green LED flashes in case of insufficient irradiation: mains connection conditions have not yet been reached. Wait for sufficient irradiation.

   or

   ☑ The red or yellow LED is lit or flashing: a fault has occurred. Proceed to step 3.

A	Green LED	Operation
B	Red LED	Earth fault or varistor defective
C	Yellow LED	Fault



Self-test in accordance with DK 5940, Ed. 2.2 during initial start-up (applies to Italy only)

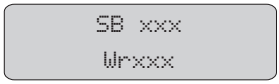
The Italian DK 5940 standard prescribes that an inverter can only operate on the power distribution mains after the disconnection times for overvoltage, undervoltage, minimum frequency and maximum frequency have been checked.

Start the self-test as described in Section 6.3 "Self-test in Accordance with DK 5940, Ed. 2.2 (Applies to Italy Only)" (page 40). The test takes approx. 8 minutes.

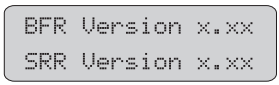
3. Read Section 9 "Troubleshooting" (page 52) and if necessary, eliminate the error or fault.

6.2 Display Messages during the Startup Phase

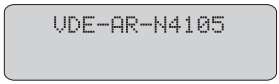
- After commissioning, the inverter displays the device type in the startup phase.



- After 5 seconds or when you tap on the enclosure lid again, the firmware version of the internal processors is displayed by the inverter.



- After a further 5 seconds or when you tap again, the configured country standard is displayed by the inverter (example: "VDE-AR-N4105").



Show the display messages again (valid from firmware version 4.00)

If you want to view the display messages of the startup phase again while in normal operation, double tap on the enclosure lid.

6.3 Self-test in Accordance with DK 5940, Ed. 2.2 (Applies to Italy Only)

6.3.1 Starting the Self-test by Tapping

You can start testing the disconnection times by tapping on the enclosure lid. A prerequisite here is that the rotary switch for language settings on the inverter has been set to Italy (IT/DK5940) or "trimmed". Proceed as follows for checking the disconnection times:

1. Connect the PV array to the inverter. The inverter can only initialise if the PV array produces enough power. It is therefore not possible to test the disconnection times at night.
2. Connect the inverter on the AC side. For this, you have to establish the AC connection (AC plug or direct connection) and/or switch on the miniature circuit-breaker of the mains cable (fuse or miniature circuit-breaker).
3. The inverter is now in the initialisation phase, i.e. all three LEDs are lit at the same time.

   Start the self-test **immediately** after all three LEDs have gone out by tapping on the display of the inverter.
4. The question of whether you would like to start the test sequence appears in the display. Tap on the display again within 30 seconds to confirm the question.

Once you have started the test sequence, the inverter checks the disconnection times for overvoltage, undervoltage, maximum frequency and minimum frequency one after the other. During the tests, the inverter shows the values in the display which are described in Section 6.3.2 "Completion of the Self-test" (page 40).

6.3.2 Completion of the Self-test

Note down the values which are displayed during the self-test. These values must be entered into a test report. The test results of the individual tests are displayed three times, one after the other. The respec-tive display message is displayed for 10 seconds.

The self-test changes the upper and lower disconnection thresholds for each protective function on a linear basis with a modification of 0.05 Hz/s and 0.05 Vn/s for the frequency and voltage monitoring. As soon as the actual measured value is outside the permissible range (modified disconnection threshold), the inverter disconnects itself from the mains. In this way, the inverter determines the reaction time and checks itself.

Overvoltage Test

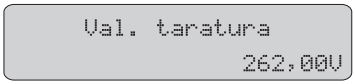
The inverter begins with the overvoltage test. During the test sequence, the voltage limit applied is shown in the display of the inverter.

The voltage limit is reduced successively until the disconnection threshold is reached and the inverter disconnects from the mains.

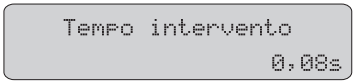
Once the inverter has disconnected from the mains, the display successively shows the following values one after the other:

- Disconnection value,

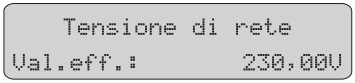
- Calibration value,



- Reaction time,



- Current line voltage.



Undervoltage Test

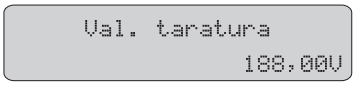
After the overvoltage test, the inverter performs the undervoltage test. During the test sequence, the current calibration value of the voltage limit applied is shown in the display of the inverter.

The voltage limit is increased successively until the disconnection threshold is reached and the inverter disconnects from the mains.

Once the inverter has disconnected from the mains, the display successively shows the following values one after the other:

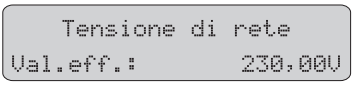
- Disconnection value,

- Calibration value,



- Reaction time,

- Current line voltage.



Maximum Frequency

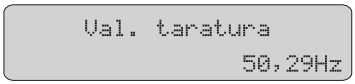
In a third step, the inverter tests the maximum frequency. During the test sequence, the frequency limit applied is shown in the display of the inverter.

The frequency limit is reduced successively until the disconnection threshold is reached and the inverter disconnects from the mains.

Once the inverter has disconnected from the mains, the display successively shows the following values one after the other:

- Disconnection value,

- Calibration value,



- Reaction time,

- Current power frequency.

Minimum Frequency

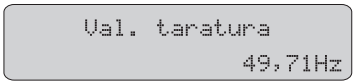
In the last step, the inverter tests the minimum frequency. During the test sequence, the frequency limit applied is shown in the display of the inverter.

The frequency limit is increased successively until the disconnection threshold is reached and the inverter disconnects from the mains.

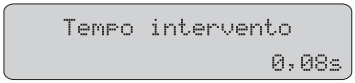
Once the inverter has disconnected from the mains, the display successively shows the following values one after the other:

- Disconnection value,

- Calibration value,



- Reaction time,



- Current power frequency.

Once the inverter has carried out the four tests, it switches to "MPP operation (MPP)" mode. The original calibration values are then re-set and the inverter automatically connects to the mains. If you would like to carry out the test again, you must disconnect the inverter, i.e. disconnect it on the AC and DC sides and then later recommission it. You can then restart the self-test as described in Section 6.3.1 "Starting the Self-test by Tapping" (page 40). The inverter starts again the test sequence as described in Section 6.3.2 "Completion of the Self-test" (page 40).

7 Opening and Closing

7.1 Safety

DANGER!
Risk of lethal electric shock

Before opening the inverter, observe the following:

- Ensure that no voltage is present on the AC side.
- Ensure that neither voltage nor current is present on the DC side.

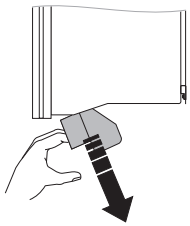
NOTICE!
Electrostatic discharges can damage the inverter.

The internal component parts of the inverter can be irreparably damaged by electrostatic discharge.

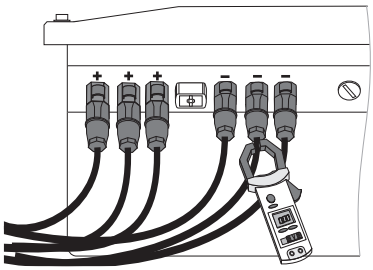
- Earth yourself before touching a component part.

7.2 Opening the Inverter

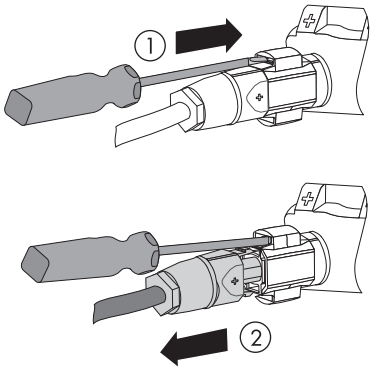
1. Disconnect the miniature circuit-breaker and secure against reconnection.
2. If an external DC switch-disconnector is present, disconnect the external DC switch-disconnector.
3. If an Electronic Solar Switch is installed, pull the Electronic Solar Switch downwards, slightly towards the wall.



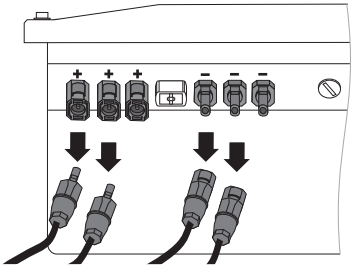
4. Using a current probe, ensure that no current is present at any of the DC cables.
   ☑ If current is present, check the installation.



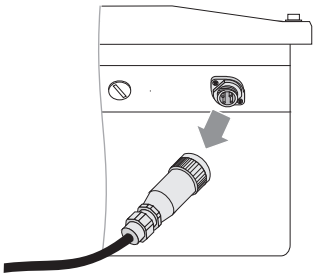
5. Unlock and disconnect all DC connectors. To do this, insert the screwdriver into one of the side slits (blade width: 3.5 mm) and pull the DC connectors straight down. Do **NOT** pull **ON THE CABLE** while doing this.



☑ All DC connectors are disconnected from the inverter. The inverter is completely disconnected from the PV array.



6. Pull out the AC plug.



7. Check whether all LEDs and the display have gone out.

DANGER!

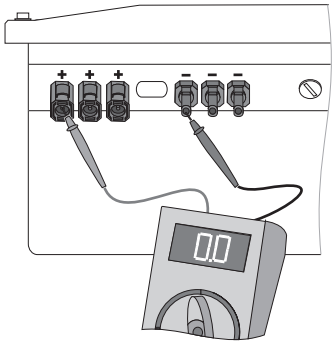
Danger to life due to high voltages in the inverter

The capacitors in the inverter require 15 minutes to discharge.

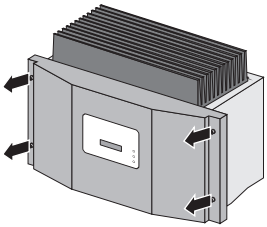
- Wait 15 minutes before opening the inverter.

8. Ensure that no voltage is present at the DC plugs on the inverter.

   ☑ If voltage is present, check the installation.



9. Remove all screws from the enclosure lid and pull the lid forward smoothly.

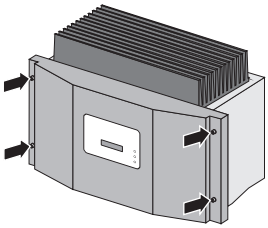


10. Remove the protective conductor (PE) connection from the lid by loosening the PE connection lock on the lid.

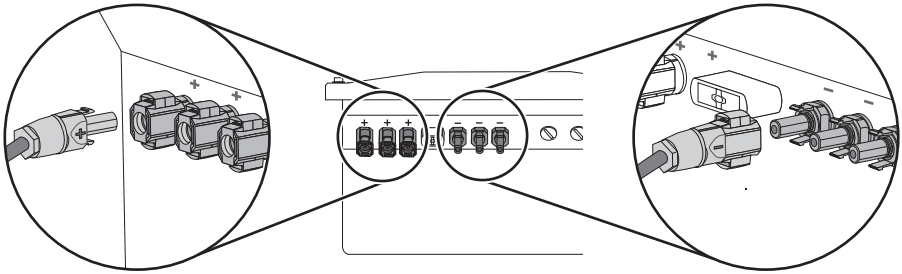
☑ The inverter is open and no voltage is present.

7.3 Closing the Inverter

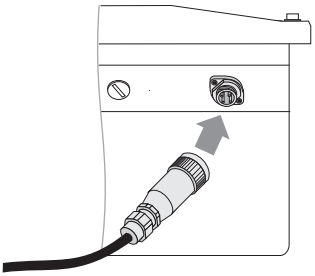
1. Establish the protective conductor (PE) connection to the enclosure lid.
2. Attach the enclosure lid of the inverter by evenly tightening the four lid screws.



3. Check the DC connectors for correct polarity and connect them.
   To unlock the DC connectors, see Section 7.2 "Opening the Inverter" (page 45).

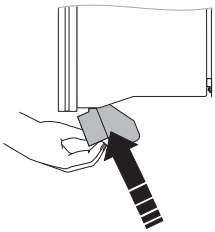


4. Close all the DC inputs that are not needed as described in Section 5.4.4 "Connecting the PV Array (DC)" (page 33) to seal the inverter.
5. Attach the AC plug.



6. If an external DC switch-disconnector is available, connect the external DC switch-disconnector.

7. If an Electronic Solar Switch is installed, check the Electronic Solar Switch for wear, as described in Section 8.2 "Checking the Electronic Solar Switch for Wear" (page 50), and reattach it firmly.



NOTICE!

Manipulating the connector in the handle can damage the Electronic Solar Switch.

The connector within the handle must remain movable in order to ensure proper contact. Tightening the screw voids all warranty claims and creates a fire risk.

- Do **not** tighten the connector screw in the Electronic Solar Switch handle.

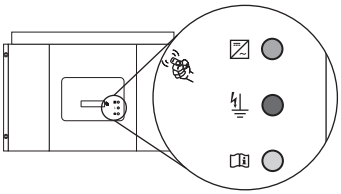
NOTICE!

The Electronic Solar Switch can be damaged if it is not plugged in correctly.

If it is not correctly connected, the Electronic Solar Switch can be damaged by high voltages.

- Plug the handle firmly onto the jack of the Electronic Solar Switch.
- Check that the handle is securely in place.

8. Switch on the miniature circuit-breaker.
9. Check whether the display and the LEDs indicate a normal operating state (see Section 6 "Commissioning" (page 38)).



☑ The inverter is closed and in operation.

8 Maintenance and Cleaning

Impurities such as dust or airborne pollen can cause a buildup of heat that can lead to yield losses. Also check the inverter and the cables for visible external damage. Repair, if necessary.

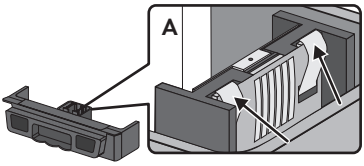
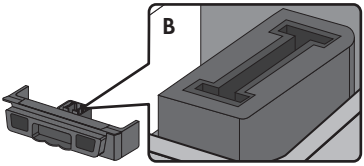
8.1 Cleaning the Inverter

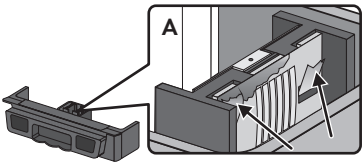
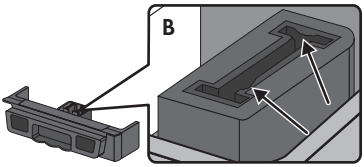
If the inverter is dirty, clean the enclosure lid, the display and the LEDs with clear water and a cloth only.

Also check the inverter and the cables for visible external damage. Repair, if necessary.

8.2 Checking the Electronic Solar Switch for Wear

Check the Electronic Solar Switch for wear before plugging it in. Depending on the shape of the Electronic Solar Switch, you can estimate the wear on either the metal tongues (shape A) or on the plastic (shape B).

Result	Measure
☑ The metal tongues in the Electronic Solar Switch are undamaged and not discoloured (A).  **or** ☑ The plastic in the Electronic Solar Switch is undamaged (B). 	1. Securely attach the Electronic Solar Switch handle. 2. Commission the inverter as described in Section 6 "Commissioning" (page 38).

Result	Measure
☑ The metal tongues in the Electronic Solar Switch have a brown discolouration or are burned through (A).  **or** ☑ The plastic in the Electronic Solar Switch shows thermal deformation (B). 	The Electronic Solar Switch can no longer reliably disconnect the DC side. 1. Replace the Electronic Solar Switch handle before attaching it again (for the order number, see Section 12 "Accessories" (page 71)). 2. Recommission the inverter as described in Section 6 "Commissioning" (page 38).

9 Troubleshooting

If the inverter displays other blink codes or error messages than those described below, contact the SMA Service Line.

You will also find a description of display messages during operation, status messages and measurement channels in the user manual provided.

Do not perform any repairs that are not described here and take advantage of the 24-hour replacement service (inverter ready for shipping and handed over to a freight-forwarding company within 24 hours) and the SMA Solar Technology AG repair service instead.

9.1 Blink Codes

Green	Red	Yellow	Status
Flashing	Flashing	Flashing	OK (startup phase)
Is permanently lit	Is not lit	Is not lit	OK (feed-in operation)
	Is permanently lit	Is not lit	Earth fault or varistor defective
		Is permanently lit	OK (initialisation)
Flashing quickly (3 x per second)	Is not lit	Is not lit	OK (stop)
	Is permanently lit	Is not lit	Earth fault or varistor defective
Flashing slowly (1 x per second)	Is not lit	Is not lit	OK (waiting, mains monitoring)
	Is permanently lit	Is not lit	Earth fault or varistor defective
Goes out briefly (approx. 1 x per second)	Is not lit	Is not lit	OK (derating)
	Is permanently lit	Is not lit	Earth fault or varistor defective
Is not lit	Is not lit	Is not lit	At night: OK (overnight shutdown) During the day: Electronic Solar Switch is not attached
		Is lit/flashing	Fault
	Is permanently lit	Is not lit	Earth fault or varistor defective
		Is lit/flashing	Earth fault or varistor defective and fault

9.2 Error Messages

When a fault occurs, the inverter generates a message which depends on the operating mode and the type of the fault detected.

Message	Description and corrective measure
!PV-Overvoltage! **!DISCONNECT DC!**	Overvoltage at DC input Overvoltage can destroy the inverter.
	Corrective measures Disconnect the inverter from the mains immediately. 1. Disconnect the miniature circuit-breaker. 2. If an external DC switch-disconnector is available, disconnect it. 3. If an Electronic Solar Switch is installed, remove it. 4. Remove all DC connectors. 5. Check the DC voltage: – If the DC voltage is above the maximum input voltage, check the plant design or contact the PV array installer. – If the DC voltage is below the maximum input voltage, reconnect the inverter to the PV array as described in Section 5.4 "PV Array Connection (DC)" (page 29). If the message occurs again, disconnect the inverter again and contact the SMA Service Line (see Section 13 "Contact" (page 72)).
ACVtgRPro	The 10-minute average line voltage is no longer within the permissible range. This can be caused by either of the following: • The line voltage at the termination point is too high. • The mains impedance at the termination point is too high. The inverter disconnects from the mains to assure compliance with the power quality.
	Corrective measures Check the line voltage at the termination point of the inverter: • If, due to the local mains conditions, the line voltage is 253 V or more, ask the network operator whether the voltage at the feed-in point can be adjusted, or whether they would agree to an alteration of the limiting value of parameter "ACVtgRPro" for power quality monitoring. • If the line voltage is continually within the tolerance range and this error message is still displayed, contact the SMA Service Line.
Bfr-Srr	Internal measurement comparison fault or hardware defect
	Corrective measures • If this fault occurs frequently, contact the SMA Service Line.

Message	Description and corrective measure
EEPROM	Transition fault while data is being written or read from EEPROM. The data is not relevant for safe operation. This fault has no effect on the performance of the inverter.
EEPROM dBh	EEPROM data is defective, the device has switched off because the loss of data has disabled important functions of the inverter.
	Corrective measures • Contact the SMA Service Line.
EeRestore	One of the duplicate records in the EEPROM is defective and has been reconstructed without loss of data. • This error message only serves to inform you and has no effect on the performance of the inverter.
Fac-Bfr **Fac-Srr** **FacFast**	The power frequency is no longer within the permissible range ("Bfr" or "Srr" is an internal message of no relevance for the user). The inverter disconnects itself from the power distribution mains for safety reasons.
	Corrective measures • Check the mains connection and contact the network operator if necessary. • If the power frequency is within the tolerable range, but "Fac-Bfr", "Fac-Srr"or "FacFast" faults are still displayed, contact the SMA Service Line.
Imax	Overcurrent on the AC side. This message is displayed if the current in the AC mains is higher than specified.
	Corrective measures • Check the plant design and mains conditions.
K1-Close **K1-Open**	Error during relay test
	Corrective measures • If this fault frequently occurs or occurs several times consecutively, contact the SMA Service Line.
MSD-Fac **MSD-Vac** **MSD-Timeout**	Internal measurement comparison fault or hardware defect.
	Corrective measures • If this fault occurs frequently, contact the SMA Service Line.
offset	The "offset" operating state is a normal operating state that occurs prior to mains monitoring. If "offset" is displayed as an error, there is a fault in the data logging.
	Corrective measures • If this fault occurs frequently, contact the SMA Service Line.

Message	Description and corrective measure
Earthfault	The electrical insulation between the PV plant and earth is defective. The resistance between the DC plus and/or DC minus connection and earth is outside the defined limit range.
	Corrective measures • Check the insulation of the PV plant. • Check the installation for earth faults as described in Section 9.3.1 "Checking the PV Array for Earth Faults" (page 57).
ROM	The inverter's firmware is faulty.
	Corrective measures • If this fault occurs frequently, contact the SMA Service Line.
Shutdown	Temporary inverter fault.
	Corrective measures • Contact the SMA Service Line.
Vac-Bfr **Vac-Srr**	The line voltage is no longer within the permissible range ("Bfr" or "Srr" is an internal message of no relevance for the user). This fault can be caused by any of the following conditions: • Mains disconnected (miniature circuit-breaker, fuse) • AC cable is interrupted • AC cable is highly resistive The inverter disconnects itself from the power distribution mains for safety reasons.
	Corrective measures • Check the line voltage and mains connection on the inverter. • If the line voltage lies outside the acceptable range because of local mains conditions, ask the network operator if the voltages can be adjusted at the feed-in point or if they agree to changes in the values of the monitored operating limits (operating parameters: Vac-Min and Vac-Max). • If the line voltage lies within the tolerance range, yet "Vac-Bfr" or "Vac-Srr" faults are still displayed, contact the SMA Service Line.

Message	Description and corrective measure
VpvMax	Overvoltage at DC input. The inverter may be damaged.
Vpv-Max	**Corrective measures** Immediately disconnect the inverter from the mains. 1. Disconnect the miniature circuit-breaker. 2. If an external DC switch-disconnector is available, disconnect it. 3. If an Electronic Solar Switch is installed, remove it. 4. Remove all DC connectors. 5. Check the DC voltage: – If the DC voltage is above the maximum input voltage, check the plant design or contact the PV array installer. – If the DC voltage is below the maximum input voltage, reconnect the inverter to the PV array as described in Section 5.4 "PV Array Connection (DC)" (page 29). If the message occurs again, disconnect the inverter again and contact the SMA Service Line (see Section 13 "Contact" (page 72)).
Watchdog	Internal program run fault
Watchdog Srr	**Corrective measures** • If this fault occurs frequently, contact the SMA Service Line.

9.3 Red LED is Permanently Lit

If the red status display LED is permanently lit during operation, there is an earth fault in the PV array, at least one of the varistors for overvoltage protection is defective or there is an insulation fault.

Procedure

1. Check for earth faults in the PV array as described in Section 9.3.1 "Checking the PV Array for Earth Faults" (page 57).
2. If the red LED continues to be lit, check the varistors as described in Section 9.3.2 "Checking the Function of the Varistors" (page 59).

9.3.1 Checking the PV Array for Earth Faults

1. Disconnect the inverter from both the DC and AC sides as described in Section 7.2 "Opening the Inverter" (page 45).

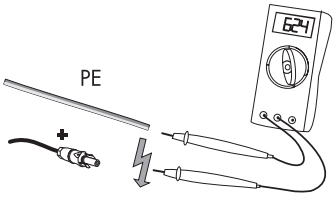
DANGER!
Risk of lethal electric shock

- Only touch the cables of the PV array on their insulation.
- Do not connect strings with earth faults to the inverter.

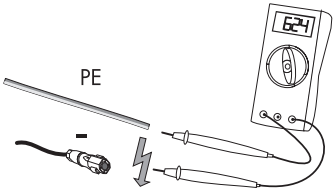
NOTICE!
Excessive voltages can destroy the measuring device.

- Only use measuring devices with a DC input voltage range up to at least 1 000 V.

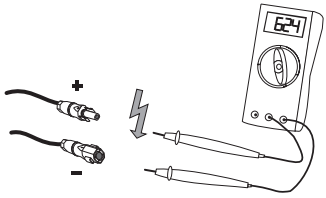
2. Measure the voltages between the positive pole of each string and the earth potential (PE).



3. Measure the voltages between the negative pole of each string and the earth potential (PE).



4. Measure the voltages between the positive and negative poles of each string.



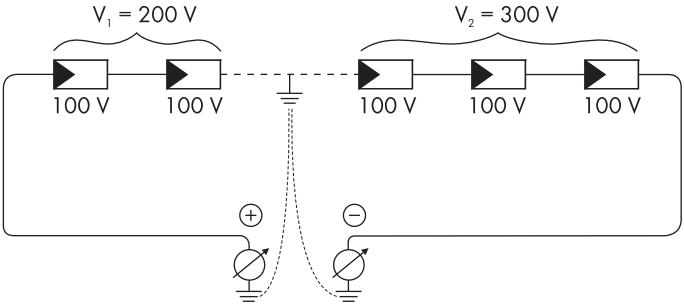
☑ An earth fault exists if the measured voltages are stable and the sum of the voltages from the positive pole to the earth potential and from the negative pole to the earth potential of a string is approximately equal to the voltage between the positive and negative poles.

Result	Measure
☑ You have found **an earth fault**.	• The installer of the PV array must remedy the earth fault in the affected string. You can determine the location of the earth fault as described below. • Do **not** reconnect the faulty string. • Commission the inverter as described in Section 6.1 "Commissioning the Inverter" (page 38).
☑ You have found **no earth fault**.	It is likely that one of the thermally monitored varistors is defective. • Check the varistors as described in Section 9.3.2 "Checking the Function of the Varistors" (page 59).

Location of the Earth Fault

The approximate position of the earth fault can be determined from the ratio of the measured voltages between the plus pole against earth potential and the minus pole against earth potential (PE).

Example:



In this case, the earth fault is between the second and third PV modules.

☑ The earth fault check is finished.

9.3.2 Checking the Function of the Varistors

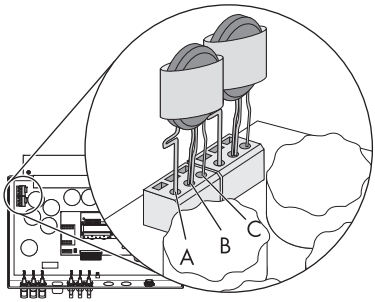
Varistors are wear parts. Their functional efficiency diminishes with age or repeated strain as a result of overvoltage. It is therefore possible that one of the thermally monitored varistors has lost its protective function, and thus the red LED is lit.

Position of varistors

You can determine the position of the varistors using the illustration below.

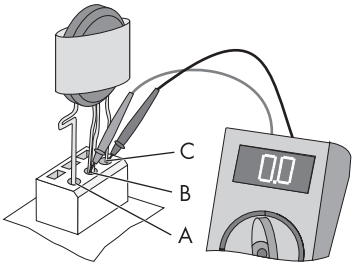
Observe the following assignment of the terminals:

- Terminal A: outer terminal (varistor connection **with loop** [crimp])
- Terminal B: middle terminal
- Terminal C: outer terminal (varistor connection **without loop** [crimp])



Check the function of the varistors as described below:

1. Open the inverter as described in Section 7.2 "Opening the Inverter" (page 45).
2. Using a multimeter and with both varistors installed, determine whether there is a conductive connection between terminals B and C.



Result	Measure
☑ There is a **conducting** connection.	There is probably a different error in the inverter. • Contact the SMA Service Line (see Section 13 "Contact" (page 72)).

Result	Measure
☑ There is **no conducting** connection.	The respective varistor is defective and must be replaced. Varistor failure is generally due to influences which affect all varistors similarly (temperature, age, induced overvoltage). SMA Solar Technology AG recommends that you replace both varistors. The varistors are specially manufactured for use in the inverter and are not commercially available. They must be ordered directly from SMA Solar Technology AG (see Section 12 "Accessories" (page 71)). • To replace the varistors, proceed to step 3.

NOTICE!

Destruction of the inverter due to overvoltage

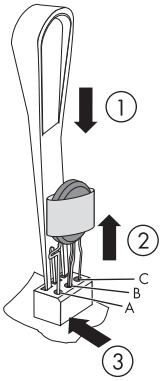
If varistors are missing, the inverter is no longer protected against overvoltages.

- Replacement varistors should be obtained as soon as possible.
- Do **not** operate the inverter without varistors in installations with a high risk of overvoltages.

3. Insert an insertion tool into the openings of the terminal contacts (1).

   ☑ The terminals will loosen.

   If you do not receive an insertion tool for operating the terminals with your replacement varistors, contact SMA Solar Technology AG. As an alternative, the individual terminal contacts can be operated using a screwdriver with a blade width of 3.5 mm.



4. Remove the varistor (2).
5. Insert the new varistor (3).

   The pole with the small loop (crimp) must be fitted to terminal A when replacing the varistor.

6. Close the inverter as described in Section 7.3 "Closing the Inverter" (page 48).

☑ The check and replacement of the varistors is completed.

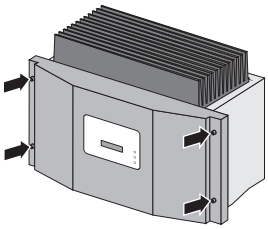
10 Decommissioning

10.1 Unmounting the Inverter

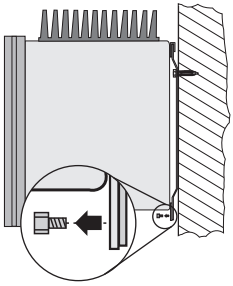
CAUTION!
Risk of injury due to the heavy weight of the inverter

- Note that the inverter weighs approx. 32 kg.

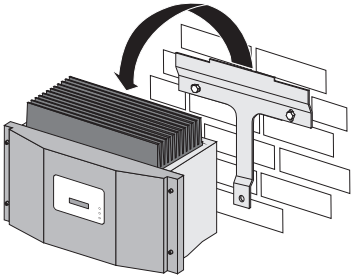
1. Open the inverter as described in Section 7.2 "Opening the Inverter" (page 45).
2. Remove all cables from the inverter.
3. Close the inverter with the four screws.



4. Loosen the lower screw between the inverter and the wall mounting bracket.



5. Lift the inverter off the wall mounting bracket.



☑ The inverter is unmounted.

10.2 Packing the Inverter

If possible, always pack the inverter in its original packaging. If it is no longer available, you can also use an equivalent box. The box must be completely closeable and made to support both the weight and the size of the inverter.

10.3 Storing the Inverter

Store the inverter in a dry place where ambient temperatures are always between –25°C and +60°C.

10.4 Disposing of the Inverter

Dispose of the inverter at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation site at that time. Alternatively, send it back to SMA Solar Technology AG with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("for disposal") (see Section 13 "Contact" (page 72)).

11 Technical Data

11.1 Sunny Boy 2500

DC Input

Maximum DC power at cos φ = 1	2 700 W
Maximum input voltage*	600 V
MPP voltage range	224 V ... 480 V
Rated input voltage	300 V
Minimum input voltage	224 V
Start input voltage	300 V
Maximum input current	12 A
Maximum input current per string	12 A
Number of independent MPP inputs	1
Strings per MPP input with ESS	3
Strings per MPP input	1

* The maximum open-circuit voltage which can occur at a cell temperature of – 10°C, must not exceed the maximum input voltage.

AC Output

Rated power at 230 V, 50 Hz	2 300 W
Maximum apparent AC power	2 500 VA
Rated mains voltage	230 V
Nominal AC voltage	220 V/230 V/240 V
AC voltage range	160 V ... 265 V
Nominal AC current at 220 V	10.5 A
Nominal AC current at 230 V	10.0 A
Nominal AC current at 240 V	9.6 A
Maximum output current	12.5 A
Total harmonic factor of output current at AC THF voltage < 2%, AC power > 0.5 AC rated power	≤ 3%
Rated power frequency	50 Hz
AC power frequency	50 Hz/60 Hz
Operating range at AC power frequency 50 Hz	45.5 Hz ... 54.5 Hz
Operating range at AC power frequency 60 Hz	55.5 Hz ... 64.5 Hz
Power factor at rated power	1
Feed-in phases	1
Connection phases	1

Overvoltage category according to IEC 60664-1	III
Maximum cable length at conductor cross-section of 1.5 mm²	9 m
Maximum cable length at conductor cross-section of 2.5 mm²	15.5 m

Protective Devices

DC reverse polarity protection	Short-circuit diode
Input-side disconnection device	Electronic Solar Switch
DC overvoltage protection	Thermally monitored varistors
AC short-circuit current capability	Current control
Mains monitoring	SMA Grid Guard 2.1
Maximum permissible fuse protection	16.0 A
Earth fault monitoring	Insulation monitoring: R_{iso} > 1 MΩ
Galvanic isolation	Available

General Data

Width x height x depth with Electronic Solar Switch	440 mm x 339 mm x 214 mm
Weight	28 kg
Length x width x height of packaging	532 mm x 392 mm x 318 mm
Transport weight	33.1 kg
Climatic category according to IEC 60721-2-1	4K4H
Operating temperature range	– 25°C ... +60°C
Maximum permissible value for relative humidity, non-condensing	100%
Maximum operating altitude above MSL	2 000 m
Noise emission (typical)	≤ 33 dB(A)
Power loss in night operation	≤ 0.25 W
Topology	LF transformer
Cooling concept	Convection
Electronics degree of protection according to IEC 60529	IP65

Country standards, as of 11/2011*	VDE0126-1-1 AS4777 C10/11 PPDS GBT19939-2005 PPC EN 50438 RD1663 RD661 G83/1-1 DK5940 VDE-AR-N 4105 UTE C 15-712-1

* EN 50438: does not apply to all country standard deviations of EN 50438.
DK 5940: only applies for SB 2500-IT.

Climatic Conditions in Accordance with IEC 60721-3-4, Installation Type C, Category 4K4H

Extended temperature range	– 25°C ... +60°C
Extended humidity range	0% ... 100%
Extended air pressure range	79.5 kPa ... 106 kPa

Climatic Conditions in Accordance with IEC 60721-3-4, Transport Type E, Category 2K3

Temperature range	– 25°C ... +70°C

Features

DC connection	SUNCLIX DC connector
AC connection	AC connector
Display	LC text display
Bluetooth® Wireless Technology	Optional
RS485, galvanically isolated	Optional

Electronic Solar Switch (Optional)

Electrical endurance in the event of a short circuit, with a nominal current of 35 A	Min. 50 switching processes
Maximum switching current	35 A
Maximum switching voltage	800 V
Maximum PV power	12 kW
Degree of protection when plugged	IP65
Degree of protection when unplugged	IP21

Torque

Enclosure lid screws	6.0 Nm
Additional earthing screw	6.0 Nm
Cheese-head screw for attaching the enclosure to the wall mounting bracket	6.0 Nm
SUNCLIX swivel nut	2.0 Nm
RS485 communication connection	1.5 Nm

Grounding Systems

IT earthing system	Suitable
TN-C earthing system	Suitable
TN-S earthing system	Suitable
TN-C-S earthing system	Suitable
TT earthing system	Suitable
Split phase	Suitable

Efficiency

Maximum efficiency, η_{max}	94.1%
European weighted efficiency, η_{EU}	93.2%

11.2 Sunny Boy 3000

DC Input

Maximum DC power at cos φ = 1	3 200 W
Maximum input voltage*	600 V
MPP voltage range	268 V ... 480 V
Rated input voltage	350 V
Minimum input voltage	268 V
Start input voltage	330 V
Maximum input current	12 A
Maximum input current per string	12 A
Number of independent MPP inputs	1
Strings per MPP input with ESS	3
Strings per MPP input	1

* The maximum open-circuit voltage which can occur at a cell temperature of – 10°C, must not exceed the maximum input voltage.

AC Output

Rated power at 230 V, 50 Hz	2 750 W
Maximum apparent AC power	3 000 VA
Rated mains voltage	230 V
Nominal AC voltage	220 V/230 V/240 V
AC voltage range	160 V ... 265 V
Nominal AC current at 220 V	12.5 A
Nominal AC current at 230 V	12.0 A
Nominal AC current at 240 V	11.5 A
Maximum output current	15.0 A
Total harmonic factor of output current at AC THF voltage < 2%, AC power > 0.5 AC rated power	≤ 3%
Rated power frequency	50 Hz
AC power frequency	50 Hz/60 Hz
Operating range at AC power frequency 50 Hz	45.5 Hz ... 54.5 Hz
Operating range at AC power frequency 60 Hz	55.5 Hz ... 64.5 Hz
Power factor at rated power	1
Feed-in phases	1
Connection phases	1

Overvoltage category according to IEC 60664-1	III
Maximum cable length at conductor cross-section of 2.5 mm²	12.5 m

Protective Devices

DC reverse polarity protection	Short-circuit diode
Input-side disconnection device	Electronic Solar Switch
DC overvoltage protection	Thermally monitored varistors
AC short-circuit current capability	Current control
Mains monitoring	SMA Grid Guard 2.1
Maximum permissible fuse protection	16.0 A
Earth fault monitoring	Insulation monitoring: $R_{iso} > 1$ M Ω
Galvanic isolation	Available

General Data

Width x height x depth with Electronic Solar Switch	440 mm x 339 mm x 214 mm
Weight	32 kg
Length x width x height of packaging	532 mm x 392 mm x 318 mm
Transport weight	36.6 kg
Climatic category according to IEC 60721-2-1	4K4H
Operating temperature range	– 25°C ... +60°C
Maximum permissible value for relative humidity, non-condensing	100%
Maximum operating altitude above MSL	2 000 m
Noise emission (typical)	≤ 30 dB(A)
Power loss in night operation	≤ 0.25 W
Topology	LF transformer
Cooling concept	Convection
Electronics degree of protection according to IEC 60529	IP65

Country standards, as of 11/2011*	VDE0126-1-1 AS4777 C10/11 PPDS GBT19939-2005 PPC EN 50438 RD1663 RD661 G83/1-1 DK5940 VDE-AR-N 4105 UTE C 15-712-1

* EN 50438: does not apply to all country standard deviations of EN 50438.
DK 5940: only applies for SB 3000-IT.

Climatic Conditions in Accordance with IEC 60721-3-4, Installation Type C, Category 4K4H

Extended temperature range	– 25°C ... +60°C
Extended humidity range	0% ... 100%
Extended air pressure range	79.5 kPa ... 106 kPa

Climatic Conditions in Accordance with IEC 60721-3-4, Transport Type E, Category 2K3

Temperature range	– 25°C ... +70°C

Features

DC connection	SUNCLIX DC connector
AC connection	AC connector
Display	LC text display
Bluetooth	Optional
RS485, galvanically isolated	Optional

Electronic Solar Switch (Optional)

Electrical endurance in the event of a short circuit, with a nominal current of 35 A	Min. 50 switching processes
Maximum switching current	35 A
Maximum switching voltage	800 V
Maximum PV power	12 kW
Degree of protection when plugged	IP65
Degree of protection when unplugged	IP21

Torque

Enclosure lid screws	6.0 Nm
Additional earthing screw	6.0 Nm
Cheese-head screw for attaching the enclosure to the wall mounting bracket	6.0 Nm
SUNCLIX swivel nut	2.0 Nm
RS485 communication connection	1.5 Nm

Grounding Systems

IT earthing system	Suitable
TN-C earthing system	Suitable
TN-S earthing system	Suitable
TN-C-S earthing system	Suitable
TT earthing system	Suitable
Split phase	Suitable

Efficiency

Maximum efficiency, η_{max}	95.0%
European weighted efficiency, η_{EU}	93.6%

12 Accessories

You will find the corresponding accessories and spare parts for your product in the following overview. If required, you can order these from SMA Solar Technology AG or your specialty retailer.

Designation	Brief description	SMA order number
Electronic Solar Switch	ESS handle spare part	ESS-HANDLE:01 Also indicate the inverter's serial number.
Replacement varistors	Set of thermally monitored varistors (2 pcs.) including insertion tool	SB-TV4
Insertion tool for replacing the varistors	Insertion tool for varistor sets	SB-TVWZ
Positive earthing set	Retrofit kit for the positive connection to earth of the DC input	ESHV-P-NR
Negative earthing set	Retrofit kit for the negative connection to earth of the DC input	ESHV-N-NR
RS485 retrofit kit	RS485 interface	485PB-NR
Bluetooth retrofit kit	*Bluetooth* interface	BTPBINV-NR
SUNCLIX DC connector	Field plug for conductor cross-sections of 2.5 mm² ... 6 mm²	SUNCLIX-FC6-SET

13 Contact

If you have technical problems concerning our products, contact the SMA Service Line. We need the following data in order to provide you with the necessary assistance:

- Inverter type
- inverter serial number
- Type and number of the PV modules connected
- Optional equipment, e.g. communication devices
- Blink code or display message of the inverter

SMA Solar Technology AG

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SMA Service Line

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